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Issuchenie oslozhnenii pri primenenii vaktsiny STI.

[The study of the complications resulting from the application of STI vaccine]

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(In Russian)

THE STUDY OF THE COMPLICATIONS RESULTING FROM THE APPLICATION OF STI VACCINE

The vaccine STI is broadly used in prophylactic vaccination of agricultural animals against anthrax. It is an effective preparation; however, in some cases, it causes serious postvaccinal complications and losses among animals.

Mostly, the postvaccinal complications take place among the younglings of sheep, goats, cattle and horses.

A characteristic complication in sheep and goats is the edema which appears on the 2nd, 3rd, seldom on the 4th day after vaccination with the STI vaccine. The edema is of the size of 4x6, 8 x 10 or 10 x 12 cm, hot to the touch and painful. It spreads, sometimes, onto the stomach area.

The complications are usually connected with lameness in sheep and goats. In cases, when the complications last 6-7 days after the injection, abscesses emerge.

The complications in cattle and horses also occur at the vaccination spot usually on the 2nd, 3rd, or 4th day. They are edemas in the size of 5 x 8, 8 x 10 and 10 x 15 cm, hot to the touch and painful. The edema is sometimes of an unusually large size and descends onto the chest. Increased body temperature, soaking 40 - 41, can be noticed in the animals besides the local reaction,

Death occurs usually after 2-5 days more seldom after 7 days after vaccination in the animals which had the complication.

The autopsy of the dead animals shows infiltrate at the injection spot and hyperemia of the adjacent tissues. No visible changes of the parenchymal organs are observed. The seedings of the blood of the heart and of the parenchymal organs of the dead animals may show negative results on anthrax. While seeding in the first days from the edema and after the emergence of complications, vaccinal microbes can be isolated.

As known, the microbes of the STI vaccines have special biological properties; according to N. N. GIESBURG they do not form capsules in the animal body and do not produce sepsis. The strain of the STI vaccine possesses specific typical characteristics. Thus, for instance, it causes edema in white mice, if subcutaneously administered, - in the majority of guinea pigs, rarer in rabbits and does not cause sepsis at all in guinea pigs and rabbits, according

to the author's data.

As it is cleared now, the STI vaccine can cause sepsis in the majority of guinea pigs and in a considerable number of rabbits, which die at its titration. This is confirmed by the possibility of isolating the microbe of the STI vaccine from the blood and parenchymal organs (lungs, liver, spleen) of dead guinea pigs and mice.

The postvaccinal complications should be considered being connected not only with the biological properties of the STI vaccine, but also with the condition of the animal organism (fatness, the presence of an anaerobic pasteurellosis and other infections) and the outer conditions (hot, cold or rainy weather).

The STI vaccine, when injected to large animals, produces a local thermal reaction which, in most cases, is not significant; however, it becomes serious and complicated, if the animal body is of low resistance.

In the past too, complications did arise when living anthrax vaccines were administered, for instance when using PASTEUR'S and TSENKOVSKII'S vaccines. While experimenting, a number of researchers noted just few factors of the complications resultant from the administration of the TSENKOVSKII vaccines; they considered that the complications occur because of the changes in the biological properties of different series; depending on the increase of their virulence.

S. N. VYSHELSKII has indicated that, sometimes, the causes of the complication lay in the nature of the vaccine; on the other hand they do depend on the conditions of the animal organism during the vaccination period (malnutrition, physical exhaustion, overchilling etc.

Of great importance is also the presence of hidden infections, zooparasites, other diseases the animal had before the vaccination and also the increased individual sensitivity.

D. L. MYKOL'SKII (1927) indicates considerable complications after vaccination in horses which have a hidden form of piroplasmosis.

SHERN and FBAIR-NUNTZ [transliterated] (1926) have noticed edema in 50 out of 687 head of cattle which were vaccinated with the first Pasteur's vaccine. At a bacteriological exploratory incision of 4 dead cows, microbes of a malignant edema were isolated.

The State Scientific Control Institute possesses a considerable amount of material received from locations where the vaccination took place, which shows the complications resultant from the inoculations with the STI vaccine.

The material proved that the complications which occurred because of the decreased resistance of the animal organism, were the result of malnutrition and of hot, cold and rainy weather.

There are data showing the finding of Pasteurella microbes (in cattle), also of pathogens of anaerobic infections (sheep, cattle and horses) in the cadaver of animals which had died after vaccination with the STI vaccine. Evidently those animals were carriers of hidden infections.

P. I. Salei (1948) indicates, that the complications resulting after the vaccination with the STI vaccine are due to meteorological conditions such as: temperature (from 2 to -2), strong wind and rain.

According to the author, the number of complications in sheep reaches 18-37 and cases of death reach - 3-7%.

It is evident now, that complications which occur in animals after the vaccination with anthrax vaccines in general and with the vaccine STI in particular are phenomena of two factors: the micro-organism of the living vaccine STI and the macro-organism of the vaccinated animal under different conditions of the outer habitat.

A complicated process arises in the correlation of the micro-organism with the macro-organism of the animal organism has a low resistance of a symptomless infection, which cannot be diagnosed; this often leads to serious complications in the animals.

Experimental Part

The following experiments were conducted in order to study the effect of the filtrate of vaccinal edema on the complications.

The laboratory animals - guinea pigs and rabbits - were vaccinated with the STI vaccine in a prescribed dose. The edema which had developed in the body of the dead animal, was detached from the tissue, out into smallest pieces and passaged through sterilizing filter circles. After the sterility had been established, the edema filtrate was injected subcutaneously into white mice in doses of 1-2.5 ml; in 1-2 hrs. the mice were vaccinated with the STI vaccine of different doses (0.1 ml - 0.5 ml). A change for the worse in the condition of the mice inoculated with the edema filtrate, has not been observed during the test period.

The results of the experiments with the filtrate of the vaccinal STI culture were also not always according to the natural law. In some instances, the filtrate of the vaccinal STI culture did cause complications in the form of infections in white mice in a larger percentage than by injecting the STI vaccine only; however, not in all cases was such a factor observed.

Thus, the above mentioned tests do not confirm the assumption that the products of the viability of vaccinal micro-organisms (contained in the edema in great numbers) have a negative effect on the animal organism's resistance.

The vaccine, in order to prove its stable properties, has been defined, that according to the results of the examination of the cultural-morphological properties and of the virulence of the passaged strain - the STI vaccine had not changed its properties.

The question of studying the cultural-morphological properties of microbes isolated from the cadaver of animals which died because of the complication phenomena which occurred after the vaccination with the STI vaccine, become a very important section of the studies.

The laboratory received at the end of 1948 three anthrax strains which were isolated by the KURSK NIVOS from cadavers of goats which died after vaccination with the STI vaccine. By reseeded we succeeded in rehabilitating two out of the three received strains: strain No. 1075 isolated from the spleen of the dead goat and strain No. 1055, isolated from the ear of another goat. The history of the strains follows: Strain No. 1075, while grown on culture media, possessed the typical characteristics of an anthrax strain, grown - on MPB - the growth showed lucidness of the medium and a sediment development on the bottom of the test tube; on - MPA - the growth appeared in the form of R-colonies. All the white mice infected with the bouillon culture in doses of 0.1-0.5 ml, died in the period of 36-55 hrs., but the guinea pigs which were infected with a dose of

has been passaged through the organism of white mice 10 times

It has

1 ml remained alive. Smears of blood of the heart and parenthymal organs of the dead mice were dyed with safranin for the test according to Ol't(u) [transliterated]: they showed very seldom bacilli surrounded by a thin capsule. Edemas did not develop in mice.

The strain No. 1055 was slightly different according to its cultural properties. It grew diffusively in MPB. The test on animals showed that the bouillon culture caused death in white mice at a dose of 0.2 ml within - 60 hrs. Bacilli with a pale pink capsule were noticed in the smears of the organs of the dead animals. An edema developed in guinea pigs after the inoculation with the mentioned culture. The test on a conglutinated culture serum did not show capsules.

Thus, the strains No. 1075 and No. 1055 are not typical STI vaccine strains according to their properties, since the first turned out to be less and the second more virulent toward guinea pigs.

The second part of the tests was conducted on the study of cultures extracted from the cadavers of the dead animals which died of anthrax on enzootic forms after injection with STI vaccine in the summer of 1949. Fourteen strains were examined. Nine out of the 14 turned out to be typical anthrax strains according to their cultural and virulent properties, the rest were saprophytes of the genus "Bacillus". Consequently, the animals, vaccinated with the STI vaccine, were either latent or became sick after the vaccination with the anthrax vaccine.

The strains No. 1 and No. 2 were isolated from the cadaver of a goat which died within three days after vaccination with the STI vaccine, whereby the first culture was extracted from the blood of the heart, the second one - from the infiltrate of the subcutaneous cell.

Studying the cultural morphological properties of the mentioned strains, it was found the following; the seeding of the culture No. 1 in MPB resulted in a cotton-like growth and development with a lucidation of the bouillon. The seeding on MPA developed typical R-form, colonies. Based on these tests on animals, we established that the culture possesses considerable virulence and causes death in white mice, on an average of 60%, at an injection of a 0.1-0.5 ml dose; in guinea pigs - at a dose of 1 ml. The culture No. 2 which was isolated from the infiltrate of the same goat, possessed a lower virulence at the beginning, however, after the reseedings it acquired similar virulent properties as had the culture No. 1. According to the cultural properties, the strain was able to develop R-form colonies on MPA, and grew on MPB by developing cotton-like colonies and a lucidification of the bouillon. Both strains have not developed capsules but did develop edemas in white mice and guinea pigs. An important factor, typical for the STI vaccine, is the isolation of the culture from the blood of the heart of the goat which died after vaccination. This proves that the vaccinal microbes are able to penetrate into the blood of animals with a decreased resistance; this means: sepsis starts to develop.

A. A. FILIPPOVA, Veterinary Surgeon of the Izhevsk Veterinary Bacteriological Laboratory had sent two strains (No. 916 and No. 936) of the anthrax culture to the Institute's laboratory for examination. The strains had been isolated from aborted fetuses of cows which were vaccinated with the STI vaccine. It was established by elaborated studies that the mentioned strains are typical strains of anthrax microbes according to their cultural and virulent properties, because they produced death in rabbits. These facts are especially of great interest since the cows which had the abortions, remained healthy. In

our country, complications and losses of agricultural animals, caused by application of the STI vaccine, are expressed in the average in thousandths. However, the complications reach, sometimes, even 10-36% and the cases of deaths-3-12%. The course of the complications sometimes is of acute forms, e.g. when the animal dies within the first 2 days after vaccination. In these cases, the vaccination activates the latent infection in the organisms of the animals which had been vaccinated. Such a situation was noticed on one of the kolkhozes of the Eletsk raion, Grlov oblast' for the first time in 1948. It happened then that 300 sheep out of the 813 vaccinated with the STI vaccine, became sick and 105 of them died. After vaccination, the sheep died in great numbers within 24-48 hrs. A strong local inflammatory reaction and a general high rise of the body temperature were characteristic for the complications. A painful edema, hot to the touch and of different size, developed at the vaccination spot. The edema of some sheep crepitated at palpation. Lameness could be observed in many sheep. The edema in sheep hardened on the 5th-7th day, the skin of the swelling became dry and either crust or tissue necrosis developed. At the autopsy of sheep which had died in the first days, a reddish purple color of the edema was noticed, from which - when sectioned- gas beads emerged.

These data and also the local detailed studies of the matter let us assume that the animals had too an infection of another kind, which was still in a latent stage. The elaborated examination in the anthracic and anaerobic laboratory of our Institute of the pathological material of the dead sheep (of the edema-tissue and of pieces of the liver) showed that the animals were carriers of the anaerobic micro-organism - *Vibrio septique*.

Later on, we started the study on the activation of symptomless infections in laboratory animals, which were vaccinated with STI vaccine

By a great number of experiments, it was established, that rabbits which are carriers of pasteurellosis infections - die after the vaccination with the STI vaccine, within 24-48 hrs. Pasteurellosis was diagnosed in all cases at the autopsy and bacteriological examination. It must be mentioned that before the vaccination with the STI vaccine the general state of the rabbits was satisfactory.

A. N. PASHKOVSKII had also observed similar data on the activation of the STI vaccine of symptomless pasteurellosis in rabbits.

E. Sh AKOPIAN, confirmed in the anaerobic laboratory, the possibility of activating with the STI vaccine symptomless anaerobic infections of emphysematous carbuncle and vibrio septique. The author infected animals with sublethal doses of the mentioned pathogens. The animals remained healthy within 10-15 days, going through the state of symptomless infection. However, after the injection of the STI vaccine, they perished within 18-36 hrs. of that infection with which they were infected by the sublethal dose.

It must be said, that according to the analysis of the local material received, concerning the complications resulted from the vaccination with the STI vaccine, the complications had reached considerable dimensions on some farms in 1948-1949.

The causes of their origination - as usual - were never cleared; in a few cases only, could the results of bacteriological tests be obtained.

At the Pankruskhikhinskii Raion Agricultural Department of the Altai Krai 556 sheep were vaccinated; 169 of them had complications; 59 out of the 169 sheep died; that makes 10.6% of the total of the

vaccinated sheep. On another farm of the same raion 520 sheep were vaccinated, 74 of them had complications, 30 of the latter (5.7%) died.

The characteristics of the complications were the following: a temperature rise in the vaccinated sheep, edema on the spot of vaccination, lameness and logy condition of the animals. The bacteriological test of the cadaver of one of the sheep which had died on the 5th day after vaccination, did not show symptoms of an infectious disease. At the examination of the cadaver of another sheep which died on the 12th day after vaccination, the *B. perfringens* was isolated.

With the STI vaccine and with the formol vaccine of emphysematous carbuncle, 43 one and a half year old, well fed heifers were vaccinated on one of the kolkhozes of the Zelenginsk Raion, Astrakhan Oblast. Nearly all of the animals had complications characterized by the emergence of edemas at the vaccination spot and by high body temperature. As a result - 40 heifers died, the majority - after 24-48 hrs. after vaccination. The bacteriological test of the pathological material showed that pasteurilosis pathogens were isolated.

Two hundred nineteen head of cattle and 153 calves were vaccinated with the STI vaccine on the Shuslininsk Meat Sovkhoz, Rostov Oblast. Complications arose in the vaccinated animals the next day; they were characterized by large edemas on the injection spots, a high body temperature, heaviness and by rejection of food.

In the period of three days after vaccination, 23 mature animals became sick and ~~376~~ - died. *33 calves became sick and 17 died* All the animals were considerably well fed. It happened that the vaccination took place at the time of changing the cattle to stall maintenance and on a day of a cold snap.

Thus, according to the results of experiments conducted and observations on information received by the Institute from veterinary specialists, it can be said that by applying the STI vaccine postvaccinal complications in animals are caused by the decreased resistance of the animal organism and by the presence of a symptomless infection.

Conclusion

1. Experimental studies of the edema filtrate of white mice which was caused by the STI vaccine, proved that the edema does not decrease the organism's resistance.
2. The tenfold passaging of the STI vaccine through the organism of white mice does not change the biological properties of the vaccine.
3. It was established by the results of the study of the anthrax culture, isolated from cadavers of animals which died after vaccination that the STI vaccine does produce sepsis in some cases.
4. The results of experimental tests and observations on farms have proved that the complications caused by the application of the STI vaccine occur because of a decrease resistance of the animal organism on the basis of symptomless infection or as a result of unfavorable weather conditions.

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